

PYP002: Course Syllabus

Course Catalog Description:

Introduction to computing systems and modern digital technologies. Introduction to computer networks, cybersecurity, and digital ethics. Introduction to algorithms and python programming language. Develop an understanding of blockchain networks, internet of things, artificial intelligence, machine learning, and data science.

Pre-requisites: None

Course Objectives:

1. **Introduce** to the students the basic principles, terms and concepts of computer systems and networks.
2. Guide students to **formulate the algorithmic solution** to a problem and implement it in python programming language.
3. Help students to gain **basic understanding** and working principles of modern digital technologies.

Course Learning Outcomes:

Upon successful completion of this course, the student should be able to:

1. Identify basic elements and recognize the key concepts of computer systems and modern digital technologies.
2. Describe the key concepts related to computer networks, internet, and cybersecurity.
3. Recognize and describe the modern digital technologies that include blockchain networks, internet of things, artificial intelligence, machine learning, and data science.
4. Formulate the algorithmic solution to a problem using concepts such as conditional operations.
5. Write a program as a simple algorithmic solution using python.
6. Implement and train basic machine learning models and evaluate their performance using python.

Required Material:

- Course material will be provided on the blackboard in the form of LAB Manual, Practice Questions and Lecture Slides.
- Lectures / Labs for the course will be conducted face to face on campus. For backup, Blackboard Collaborate Ultra or MS Teams will be used.
- It is recommended for the students to install python on their personal computing devices.
- A working google account is required to access google colab website for interactive python sessions during the LABs. <https://colab.research.google.com/>

Topics Covered:

PART 01

1. Introduction to Computer Hardware and Software
2. Introduction to Digital Technologies

PART 02

3. Introduction to Computer Network and Cybersecurity
4. Basics of Blockchain Networks, Internet of Things, Virtual and Augmented Reality

PART 03

5. Introduction to algorithms and python programming
6. Variables manipulation
7. Selection structures in python

PART 04

9. Introduction to Data Science
10. Data Visualization and Analysis
11. Introduction to Artificial Intelligence and Machine Learning
12. Practical Examples using python

Assessment Plan:

Presentations		30
-	Presentation from Part 01	
-	Presentation from Part 02	
Project		30%
-	Project based on list provided (Machine Learning).	
Class Participation		20 %
-	Different practical exercises conducted during class time.	
4 Quizzes (5 x 4)		20 %
Total		100%

Material for Quizzes

1. Quiz 01
 - a. Introduction to computer hardware and software
2. Quiz 02
 - a. Computer Networks and Cybersecurity
 - b. Blockchain networks, Internet of Things and AR/VR
3. Quiz 03:
 - a. Algorithms and Python programming
 - b. Variables and Lists
 - c. If-else conditions
4. Quiz 04
 - a. Introduction to Data Science (file handling, pandas and matplotlib)
 - b. Basic AI and ML questions

Teaching Plan/Course Outline:

Week	Date	Lab Topic
1	Aug 19- 25	Computer Systems, Components, and their Functions. - Basics of computer Hardware - Working of a processor (Instruction Cycle) - Computer Memory
2	Aug 26- Sep 1	Computer Software, Operating Systems, Introduction to Digital Technologies - Introduction to computer software and data representation - Hardware / Software interaction - Introduction to operating systems - Overview of Digital Technologies
3	Sep 2-8	Introduction to Computer Networks - Basics of Computer Networks - Working of a router - Communication protocols - Information transfer on internet (TCP/IP protocol)
4	Sep 9-15	Introduction to Cybersecurity and Blockchain Networks - Basics of cybersecurity - Cryptography - Data Encryption - Hashing - Public / Private Key encryption - Blockchain Networks Last Date to create groups for projects / presentations (15th -Sept-26) Quiz 01***
5	Sep 16-22	Blockchain Networks, IoT, AR/VR - Proof of Work algorithm (Demo) - Blockchain exercise - Introduction to internet of things - Main components of IoT - Introduction to AR/VR
5	Wed – Thu Sep 23-24	National Day Holiday
6	Sep 27- Oct 1	Python Programming - Introduction to algorithms and python programming - Working with variables and list - Arithmetic and Logical operators Practice Exercises
7	Oct 4-8	Python Programming - Working with Selection/conditional statements in python - If, If-else, If-Elif - Practice Exercises Quiz 02

Week	Date	Lab Topic	
8	Oct 11-15	Presentation 01 • Week 01-02 topics • Students form groups. • Three / Four students in each group • All students involved in presentation (Equal distribution of slides) • Questions/comments from all the group members	
		Introduction to Data Science • Basics of Data Science • Learning and Analyzing Data • Explain data analysis functions of pandas. • File reading and plotting data in python • Practice Exercise	
Tue-Wed-Thu Oct 20-22		Midterm Break	
10	Oct 25- 29	October 25-26 (For SUN-MON) Introduction to AI and Machine Learning • Introduction to Artificial Intelligence and Machine Learning • Types of Machine Learning • Applications • Data classification example in Python • Practice Exercise	October 27-29 (For TUE-WED-THU) Introduction to Data Science • Basics of Data Science • Learning and Analyzing Data • Explain data analysis functions of pandas. • File reading and plotting data in python • Practice Exercise
11	Nov 1-Nov 5	Presentation 02 • Topics of Week 05-07 • Students continue with the same group. • All students involved in presentation (Equal distribution of slides) • Questions/comments from all the group members	
12	Nov 8-12	November 08-09 (For SUN-MON) Introduction to Artificial Intelligence and Machine Learning: • Complete ML Workflow in python • Basic ML Algorithms • Practice Exercise	November 10-12 (For TUE-WED-THU) Introduction to AI and Machine Learning: • Introduction to Artificial Intelligence and Machine Learning • Types of Machine Learning • Applications • Data classification example in Python • Practice Exercise
13	Nov 15-19	November 15-16 (For SUN-MON) Introduction to Artificial Intelligence and Machine Learning • Data classification example in Python • Evaluation Metrics in ML • Practice Exercise • Quiz 03	November 17-19 (For TUE-WED-THU) Introduction to Artificial Intelligence and Machine Learning • Complete ML Workflow in python • Basic ML Algorithms • Practice Exercise • Quiz 03
Sun-Mon Nov 22-23		Autumn Break	
13	Nov 24 – 26 (TUE-WED-THU)	November 26-28 (For TUE-WED-THU) Introduction to Artificial Intelligence and Machine Learning • Data classification example in Python • Evaluation Metrics in ML Practice Exercise	

Week	Date	Lab Topic
14	Nov 29 – Dec 03	Project Presentation and submission (with code) • Week 03-13 topics • Students continue with the same group. • All students involved in presentation (Equal distribution of slides) • Code demo and Questions/comments from all the group members
15	Dec 06 – 10	Project Presentation and submission (with code) • Week 03-13 topics • Students continue with the same group. • All students involved in presentation (Equal distribution of slides) • Code demo and Questions/comments from all the group members • Quiz 04
Three unexcused labs will result in a <u>DN grade without prior warning.</u>		

Presentation Evaluation Rubrics

Criteria	Description	Points
GROUP PERFORMANCE	Assessment applied equally to all group members	8
Topic Coverage & Accuracy	Presentation covers ➤ Main concepts and ideas of the topic (2) ➤ Information is accurate and explained with visuals (2)	4.0
Academic Standards & Logical Flow	Presentation should have ➤ Clear and concise slides. (Not too much text) (1) ➤ Follow academic standard (1) ▪ Presentation progresses logically from introduction to conclusion. ▪ Title slide, slide numbering ▪ Includes audience questions and closing/thank -you ▪ References slide at end. ▪ Work Distribution slide.	2.0
Team Coordination & Time Management	➤ Presentation appears coordinated and transitions between members is smooth. (1) ➤ Work is equally distributed and the group remains within the allotted time. (1)	2.0
INDIVIDUAL PERFORMANCE	Each student receives their own score	7
Individual Presentation Delivery (Verbal /Non - Verbal Communication)	➤ Speaks clearly and confidently. Does not simply read from slides. (1) ➤ Appropriate body language and engages with audience. (1)	2.0
Individual Response to Questions	➤ Provides accurate response to questions asked from any part of the presentation.	5.0
TOTAL	Group: 8 + Individual: 7	15

Project Evaluation Rubrics

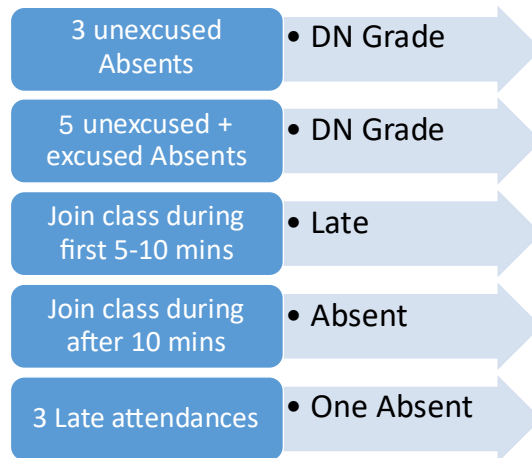
Criteria	Description	Points
GROUP PERFORMANCE	The same group-performance score is awarded to all group members.	16
Introduction and Data Analysis	➤ Clearly introduces the project problem (1) ➤ Describes the dataset, including its features, target/output variables, and total samples (2) ➤ Data Analysis (Scatter Plots of features , Histogram plot of output class) (1)	5
ML Algorithm Explanation	➤ ML Algorithm Definition (1) ➤ Visual Explanation of ML models(1) ➤ Equations and parameters explanation of ML models (1) ➤ Explain Train – Test split (1)	4
Evaluation Metrics and Results	➤ Explain what each evaluation metrics represents and measures (1) ➤ Explain the formula used to calculate the metrics (1) ➤ Present Results in a table and compare the results (1)	3
Project Code Functionality	➤ The whole code works ▪ Data processing, model training, prediction and output components	2
Team Coordination and Overall Time Management	➤ Presentation appears coordinated and transitions between members is smooth. (1) ➤ Work is equally distributed and the group remains within the allotted time. (1)	2
INDIVIDUAL PERFORMANCE	Each student receives a separate individual -performance score.	14
Individual Presentation Delivery (Verbal /Non-Verbal Communication)	➤ Speaks clearly and confidently. (1) ➤ Does not simply read from slides. (1) ➤ Appropriate body language and engages with audience. (2)	4
Individual Code Demonstration/Live Demo	➤ Personally, demonstrates a meaningful part of the project code. (2) ➤ Understand the overall workflow of the code. (2)	4
Individual Question Answers and Interaction	➤ Understanding of Data Analysis, Project Dataset, and the relevant code. (2) ➤ Understanding of ML algorithm and the relevant code (2) ➤ Understanding of Evaluation metrics and the relevant code (2)	6
TOTAL	Group: 17 + Individual: 15	30

Course Policies, Rules and Regulations for Online Classes and Assessments

- **Project Groups**
 - Students are required to form groups of 3-4 students for the presentations and project.
 - Students can change groups during the course if some members of a group leave the university.
 - The group members list should be sent to the instructor by the end of week 03. If you cannot find the group members, the instructor will randomly create groups in week 04.
- **Hardware / Software Requirements**
 - Make sure you have all the learning tools ready:
 - Reliable PC/desktop or Laptop (updated software and hardware)
 - Python should be installed on your system with English Language for practicing the exercises at home.
- **Course Website & Participation**
 - Students are required to periodically check the blackboard and download course material as needed. All resources will be posted on the blackboard as well: <https://blackboard.kfupm.edu.sa/>
- **Classes and Attendance Policy:**
 - Classes will be conducted on campus face to face.
 - Anyone who joins the class during the **first 5 - 10 minutes** will be marked **LATE**. A total of **3 late attendances** is equivalent to **one unexcused absence**.
 - Anyone who joins the classroom **after 10 minutes** will be marked **absent**.
 - Students are required to stay active during the class. This will be ensured by having interactive questions during the class time. If the student fails to respond when asked anytime during the class, he will be marked absent.

- **DN Rules:**

- A student will be given a DN grade if he/she reaches **Three (3)** unexcused absences.
- A student will be given a DN grade if he/she reaches a total of **Four (4)** absences (both excused and unexcused).
- To avoid being considered absent, an **official excuse** must be shown **no later than one week after returning to class**.



- **Quizzes**

- Quizzes will be MCQ based and conducted on the **blackboard** website.
- Students must complete the Quiz in the allotted time. No extra time will be given.

- **Project**

- Results for the project will be made available in one week.

- **Re-checking policy**

- If you have a complaint about any of your marks, discuss it with the instructor **no later than one week** after distribution of marks. Only legitimate concerns on grading should be discussed

- **Office Hours:**

- Students are encouraged to join office hours to clarify any part of the course material.

- **Academic honesty:**

- Students are expected to abide by all the university regulations on academic honesty. Cheating will be reported to the Department Chairman and will be severely penalized. Although collaboration and sharing knowledge is highly encouraged, copying others' work without proper citation, either in part or full, is considered plagiarism. Whenever in doubt, review the university guidelines or consult the instructor.

- **Cheating in any form will result in an F grade.**

- **Courtesy:**

- Students are expected to be courteous toward the instructor and their classmates throughout the duration of this course. To contact your instructor, please use KFUPM EMAIL. When necessary to send an email through the university email system, please indicate PYP002-261 in the "Subject" field of your email and mention the section number, e.g., "PYP002-261-Section XX- Question about Exercise 1"